UDP Throughput Performance of Wi-Fi HaLow at Kagawa University Campus

Atsushi YAMASAKI[†], **Junji TERAI**[††], ***Nonmembers***, ***and*** **Nobuhiko MIKI**[†a)], ***Member***

1. Introduction

Wi-Fi HaLow [1] (802.11ah [2]) can achieve higher throughput than other low-power wide-area (LPWA) technologies such as LoRa employing the sub-GHz. Therefore, this paper performs an initial assessment of Wi-Fi HaLow coverage.

2. Evaluation Methodology

The measurement is performed on the Hayashi-cho campus of Kagawa University (see Fig. 2), which is located at Takamatsu city in Japan. Figure 1 shows the experimental setup. At the transmitter side, the client PC is connected to the Wi-Fi HaLow wireless bridge BR-100AH(JP). The wireless bridge and PC are mounted on a cart and can be moved freely. Meanwhile, at the receiver side, the server PC is also connected to the Wi-Fi HaLow access point AP-100AH(JP). In the evaluation, the image transmission is assumed. Therefore, the channel bandwidth of Wi-Fi HaLow with carrier frequency of 924.5 MHz is set to 4 MHz. We execute the `iperf` commands to generate 800 kbps UDP packets to evaluate the throughput performance. In this study, we present the top performance out of five that we obtained.

3. Evaluation Results

We performed two measurements as shown in Fig. 2. The first is a distance-dependent evaluation in a line-of-sight (LOS) environment (measurement#1), while the second is an environment that changes from LOS to non-line-of-sight (NLOS) environment under relatively close distance conditions (measurement#2).

We first discuss the results of measurement#1. According to the increase of distance, the UDP throughput decreases. Especially, 800 kbps UDP throughput is not achieved when the transmitter is more than about 100 m away from the receiver (between points 1 and 2). Evaluation at another open site showed that 800 kbps could be achieved up to about 300 m. Although this environment has a line of sight, the narrow space between the building and the bicycle parking area is likely the cause of this difference.

We next discuss the results of measurement#2. 800 kbps is achieved in the LOS environment, and 800 kbps is also achieved at point (4), which is just after NLOS. However, a little further on, the received signal strength indicator (RSSI) decreases significantly, resulting in a large decrease in throughput.

[†]The author is with the Kagawa University, Hayashicho 2217-20, Takamatsu, Kagawa, 761-0396 Japan.

[††]The author is with STNet, Incorporated, Kasugacho 1735-3, Takamatsu, Kagawa, 761-0195 Japan.

a) E-mail: miki.nobuhiko@kagawa-u.ac.jp

References

[1] Wi-Fi Alliance, https://www.wi-fi.org/discover-wi-fi/wi-fi-halow.

[2] M. Park, "IEEE 802.11ah: sub-1-GHz license-exempt operation for the internet of things," in IEEE Communications Magazine, vol. 53, no. 9, pp. 145-151, Sept. 2015.

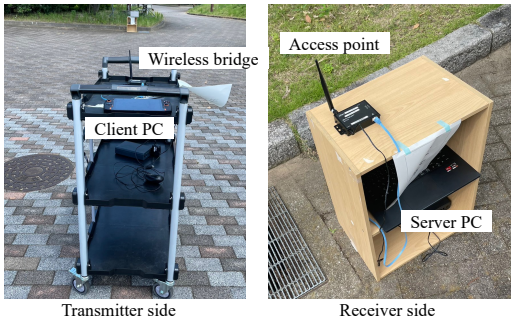

Fig. 1: Experimental setup.

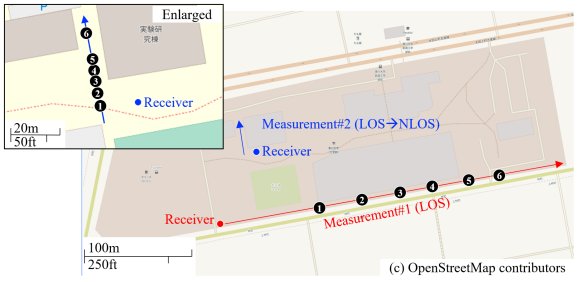

Fig. 2: Measurement area (Kagawa university).

Table 1: Measurement results.

(a) Measurement #1.

	RSSI	Throughput
(1)	−72.8 dBm	799.2 kbps
(2)	−77.5 dBm	308.1 kbps
(3)	−83.8 dBm	348.5 kbps
(4)	−85.5 dBm	149.8 kbps
(5)	−86.8 dBm	44.8 kbps
(6)	−85.0 dBm	160.7 kbps

(b) Measurement #2.

	RSSI	Throughput
(1)	−45.5 dBm	800.1 kbps
(2)	−49.0 dBm	800.3 kbps
(3)	−50.3 dBm	800.3 kbps
(4)	−55.8 dBm	799.2 kbps
(5)	−62.5 dBm	800.3 kbps
(6)	−79.3 dBm	550.5 kbps